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MWNT-modified electrodes for voltammetric determination of lipophilic vitamins

Ziyatdinova G., Morozov M., Budnikov H.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

Multi-walled carbon nanotube modified graphite electrodes (MWNT-GEs) have been created for the voltammetric determination of α-tocopherol and retinol. The electrode surface was characterized by atomic force microscopy. The MWNT-GEs presented structured surfaces and a significant (26-fold) increase in roughness over unmodified graphite electrodes (8.2 vs. 0.32 nm for MWNT-GEs and GEs, respectively). Their surfaces consisted of aggregates with a highly regular "thorn-like" structure. α-Tocopherol and retinol were oxidized on the bare GEs and the MWNT-GEs in 0.1 M HClO 4 in acetonitrile. Decreases in the overpotential of 0.2 and 0.04 V for α-tocopherol and retinol, respectively, and increased oxidation currents were observed on the MWNT-GEs in comparison with the unmodified electrodes. The calibration graphs were linear in the range 0.065-2.00 mM for α-tocopherol and 0.05-1.50 mM for retinol. The detection limits were found to be 0.05 and 0.04 mM for α-tocopherol and retinol, respectively. The developed electrodes were applied to determine α-tocopherol and retinol in pharmaceuticals. The results obtained agreed well with coulometric titration data. © Springer-Verlag 2012.

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Keywords

α-Tocopherol, Carbon nanotubes, Chemically modified electrodes, Pharmaceutical analysis, Retinol, Voltammetry